UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

MAY 17 2002

In Reply Refer To:
SWR-00-SA-5820:MEA

Michael Finan
Chief, Delta Office
U.S. Army Corps of Engineers
Regulatory Branch
1325 J Street
Sacramento, California 95814-2922

Dear Mr. Finan:

Enclosed is a final biological opinion prepared by the National Marine Fisheries Service (NMFS) for the proposed 5-year Decker Island Fish Monitoring Program, a component of the Decker Island Habitat Development Project (Reg. Br. No. 199700247), in the lower Sacramento River and its effects on federally endangered Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*), threatened Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*), and threatened Central Valley steelhead (*Oncorhynchus mykiss*) pursuant to Section 7 of the Endangered Species Act (ESA) of 1973, as amended. This biological opinion was based on a proposed fish monitoring program plan submitted by the California Department of Fish and Game (CDFG) and supplemental information provided by CDFG.

Based on the best available scientific information, this biological opinion concludes that the proposed Decker Island Fish Monitoring Program will not affect designated critical habitat and is not likely to jeopardize the continued existence of Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, or Central Valley steelhead. An incidental take statement with reasonable and prudent measures designed to minimize incidental take has been prepared and is included in this biological opinion. The incidental take statement anticipates the incidental take of Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, and Central Valley steelhead during the course of Decker Island Fish Monitoring Program field sampling activities, as described in this biological opinion.

Consultation must be reinitiated if (1) the amount or extent of incidental take specified in the incidental take statement is exceeded; (2) new information reveals that Decker Island Fish

Monitoring Program field sampling may affect winter-run chinook salmon, spring-run chinook salmon, or steelhead in a manner or to an extent not previously considered; (3) the action is subsequently modified in a manner that causes an effect to the listed species that was not considered in the biological opinion; or (4) a new species is listed, or critical habitat is designated that may be affected by the field sampling program.

The proposed project area has been identified as Essential Fish Habitat (EFH) for Pacific salmon in Amendment 14 of the Pacific Salmon Fishery Management Plan pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Federal action agencies are mandated by the MSA (section 305[b][2]) to consult with NMFS on all actions that may adversely affect EFH, and NMFS must provide EFH Conservation Recommendations (section 305[b][4][A]). However, since the Decker Island Fish Monitoring Program field sampling has been determined to have no effect on critical habitat designated pursuant to the ESA, EFH consultation is not necessary.

If you have questions or need further assistance concerning the attached biological opinion, please contact Mr. Michael Aceituno in our Sacramento Area Office, 650 Capitol Mall, Suite 8-300, Sacramento, California 95814. Mr. Aceituno can be reached by telephone at (916) 930-3600 or by Fax at (916) 930-3629.

Sincerely,

Rodney R McInnis

Rodney R. McInnis
Acting Regional Administrator

Attachment

cc: Robert E. Orcutt, Program Manager, Delta Levee Habitat Improvement Program, CDFG,
Dave Showers, California Department of Water Resources

BIOLOGICAL OPINION

Agency: Sacramento District, Army Corps of Engineers

Activity: Decker Island Fish Monitoring Program

Consultation Conducted By: Southwest Region, National Marine Fisheries Service.

Date Issued: MAY 17 2002

I. BACKGROUND AND CONSULTATION HISTORY

On May 25, 1998, the Army Corps of Engineers (Corps) originally requested concurrence with their determination that the Decker Island Habitat Development Project (199700247) would have no adverse effect on federally listed salmonids. The National Marine Fisheries Service (NMFS) concurred with the Corps determination via letter, dated June 24, 1998. However, on December 8, 1998, the U.S. Fish and Wildlife Service (FWS) issued a biological opinion on the effects of the proposed project on delta smelt and Sacramento splittail which included a requirement for a fish monitoring program.

A draft fish monitoring plan for the project, submitted by the California Department of Fish and Game (CDFG) on April 7, 1999, clearly shows the potential for take of federally listed salmon and/or steelhead. In a letter to the NMFS, dated November 10, 1999, the Corps requested concurrence of their determination of not likely to adversely effect for federally listed Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run chinook salmon (*O. tshawytscha*), and Central Valley steelhead (*O. mykiss*) for the project and associated fish monitoring program. Due to the likelihood that the take of listed salmonids would occur during implementation of the Fishery Monitoring Program required in the FWS biological opinion, the NMFS could not concur that this element of the Decker Island Habitat Development Project would not adversely effect listed salmonids. Additional information was requested by NMFS in order to initiate and complete a biological opinion on the Decker Island Fish Monitoring Program.

Materials and information relative to the Decker Island Fish Monitoring Program have been provided to NMFS in various formats. This biological opinion is primarily based on information provided by CDFG in a letter dated April 9, 2001, including as an attachment the document entitled "Decker Island Fish Monitoring Program", dated March, 2001, by Mr. Frank Gray of CDFG. A complete administrative record of this consultation is on file with the NMFS Sacramento Area Office, Sacramento, California.

II. DESCRIPTION OF PROPOSED ACTION

The Decker Island Fish Monitoring Program (Fish Monitoring Program) will be conducted by the California Department of Fish and Game (CDFG) and is designed to determine habitat value created by the Decker Island Habitat Development Project (Habitat Development Project), a State authorized AB 360 project that will restore the northern tip of Decker Island to marsh habitat by lowering land surface elevations and excavating meandering waterways and channels. The Habitat Development Project will breach Decker Island levees on Horseshoe Bend and the Sacramento River creating 0.5 acres of shallow water habitat, 0.5 acre of riverine aquatic bed, 4.o acres of emergent marsh, 3.0 acres of shaded riverine aquatic habitat, 2.0 acres of riparian woodland, and 1.2 acres of native grass and shrub, for a total of 11.2 restored acres. The Fish Monitoring Program will determine fish habitat value in the excavated waterways and channels by examining items including the following:

a. Numbers of fish caught
b. Populations of listed fish species
c. Whether the project has resulted in an increase of fish populations over those found at index sites.
d. Fish populations at project sites relative to success criteria

The Fish Monitoring Program is required under an Army Corps of Engineers (Corps) Permit No. 199700247 and must include index sites for data comparison purposes. Monitoring is also mandated under the AB 360 program to ensure that the project, as State-sponsored "enhancement", meets program goals relative to aquatic habitat development

Survey Area

Decker Island is located in the in the Sacramento-San Joaquin Delta, along the Sacramento River, approximately 5 miles upstream of its confluence with the San Joaquin River, in Solano County, California. The Fish Monitoring Program will be done within channels built as part of the Decker Island Habitat Development Project, at areas on property owned by the CDFG on Decker Island and at reference (index) sites elsewhere on or adjacent to Decker Island. Decker Island is only accessible by boat and is bounded by the Sacramento River to the northwest and Horseshoe Bend to the south and east.

Responsibility for Monitoring

All monitoring, including preparation and submission of monitoring reports, will be done by CDFG staff of the Delta Flood Protection Program or its successor except as otherwise specified in the Program. Help may be provided by DWR Central District staff and others. Monitoring and report preparation may be done by the DWR in the event that surveys cannot be done by the CDFG due to manpower and/or funding limitations. Any monitoring not done under the supervision of the CDFG will be done with an appropriate scientific collection permit or letter permit from the CDFG. The DWR may also provide monitoring equipment in the event that such equipment would otherwise be unavailable to the CDFG.

Methods

Methods used will include electrofishing, gillnetting, seining, and traps (optional). An attempt will be made to use each method at least once annually, conditions permitting. Additional required data collection applicable to all methods are in the miscellaneous section below. Also, there is a goal to set up monitoring area procedures where there can be repeatability, such as sampling in subsequent years.

A fisheries biologist experienced in the use of all monitoring methods will be present at all times, supervising all monitoring activities.

A summary of fish survey methods to be used are compared in Table 1, and are described below:

Table 1. Summary of Fish Survey Methods, Decker Island, Solano County

Method	Time of Year	Location	Time (am/pm)	Boat Required (y/n)	Species most effective for	Best Tide Stage for Monitoring	Relative Priority of use (1-highest, 4 lowest)
Electrofishing	Spring	all sites	pm	y	most effective for centrarchids	high	2
Seining	Spring	inside channels	am/pm	y	small, open water schooling species	high	1
Gillnetting	Spring	channel openings	am/pm	y	large native minnows, catfish	high	3
Traps	all year	inside channels	am/pm	n	small, cover oriented species	unknown	4

1. Electrofishing: Electrofishing will be done from a 16-18 foot electrofishing boat. The electrodes at the bow will be brought close to shore, facilitating fish capture. Immobilized fish will be kept on board in a circulating tank, data collected, and the fish released.

Monitoring will be completed in the spring, when most Delta fish species are spawning.

All electrofishing will be done at night, preferably during a high tide. It will be completed at all shoreline areas on CDFG property at Decker, including that in the newly created channels. Electrofishing will only be completed if salinity, water depth and turbidity, wind, and other conditions permit.

Monitoring station boundaries will be marked in advance by placing reflectors mounted on non-wooden poles. Boundary markers will be placed so that monitoring station boundaries are clearly visible to boat operators at night.

All electrofishing will be completed using electrofishing boats owned by the CDFG, unless boats owned by others are needed. Survey stations will be selected both inside and outside of the channels.

Electrofishing data to be recorded will include seconds of electrofishing time per station, amps used, and fish species found in association with certain habitat or underwater structure types, if known.

Electrofishing equipment will have state-or-the-art electronic circuits and probes that allow for variable output of the electric current and are designed to reduce impacts to fish. Operators will calibrate the equipment for their individual waters and will monitor conductivity, fishing effectiveness, fish response, and electric output (watts, volts, amps, pulse frequency, and width). Also, only investigators properly trained in electrofishing techniques will conduct the electrofishing.

A log will be maintained of all electrofishing activities for the purpose of improving technique and knowledge about the specific gear, fish, and waters in which the Permit Holder electrofishes. The log will record; gear type, location, conductivity, water clarity, water temperature, estimated flow, estimated weed cover, description of fishing effectiveness, fish response, electrical output (watts, volts, amps, pulse frequency, and width) minutes of fishing effort, catch, and disposition of captured fish.

2. Seining: Seines will be used in channels if conditions permit. The depth must be at least six feet deep or otherwise sufficient to sample the entire water column. It is anticipated that beach seines 50 feet or longer will be used. The size of the seines will be determined based upon the final constructed channel widths and depths. It will be completed during day or night. A minimum of three widely separated channels will be selected during each survey, and those channels selected for the initial surveys will be monitored during each successive year, unless monitoring conditions require selection of other coves.

Seining will be completed using the catch depletion method, with the goal of ultimately catching all fish within a confined area. Each channel will be blocked off at the entrance with a small-mesh block net. The seine will be pulled from the block net towards the end of the cove. All captured fish will be released outside of the sample area, at least 100 feet from the block net. Successive seine hauls will be made as soon as data are recorded from the prior haul. Seining will continue until there is no decrease in fish numbers captured in two consecutive seine hauls.

Various steps will be taken to reduce mortality during the seining operation. These include, but are not limited to, the following:

1. Keeping the seine untwisted.

2. Avoiding seining during hot weather (over 90 degrees F).
3. Avoiding dragging the net over the substrate.
4. Removal of all rocks, mud, and other debris in the net.
5. Measuring of fish in the shade whenever possible.
6. Keeping the bag of the net and any fish contained within, in the water as much as possible.
7. Processing of salmonids and Delta smelt first.

Numbers of fish caught during each successive seine haul will be recorded separately. Total numbers of fish within each channel will be estimated for the area by plotting the catches of each seine haul as points on a graph and using regression techniques.

Seining locations will also be located elsewhere at Decker Island as conditions permit.

3. Gillnets: Gillnets will be used on an experimental basis. The main concern is that they must be monitored at all times and not take listed fish species. The nets will be pulled in and fish released unharmed, if possible, at intervals of not greater than every half hour. Gillnets will be used for a minimum of four hours during each monitoring period.

Gillnets will be variable-mesh monofilament with a minimum stretch-mesh size of 3/4 inch. Data recorded will include gillnet mesh used, and fish species in each size mesh, if possible.

4. Traps: Use of traps is optional. These include anchoring stationary devices and recovering them later.

Index (Control) Sites:

Index (Control) sites are fish habitat areas which serve as references for determining project success. There shall be a minimum of two sites and these will be monitored each year using the same techniques as for the project areas. These shall be at the outer periphery of Decker Island. These shall be chosen to represent typical pre-project conditions along the shoreline of Decker Island. These are required by the COE permit.

Success Criteria:

All of the following success criteria relate to Project areas. The following success criteria only refer to those fish species native to the Sacramento-San Joaquin Delta (Delta). It also only refers to those fish found at project areas.

a. Increase in the number of fish species by each species for each monitoring method
b. Increase in the number of fish
c. Increase in the number of fish relative to those found at index sites
d. Presence of and increase in numbers over successive years of listed fish species, including Delta smelt and spring-run chinook salmon
e. Demonstrated attraction of fish species to project structures, including channels

Miscellaneous:

All measurements shall be recorded and presented in monitoring reports as metric units except as otherwise noted in the Program. Monitoring at the same coves and index areas will be performed during successive years unless in-water conditions prevent it. All captured fish will be released unharmed if possible. Also, there is a goal to set up monitoring areas where there can be repeatability, such as sampling in a cove on subsequent years and attempting to repeat monitoring during similar conditions (tides, etc). The following observations will be recorded during each monitoring period, irrespective of survey method used:

a. Fish:
  1. Fork lengths (numbers greater than 30 fish in a sample will be counted and not measured.
  2. Species.
  3. Location by sampling station .
  4. Association of fish with habitat if known.
  5. Mortality of the following fish species: Delta smelt, winter and spring - run chinook salmon, Sacramento splittail, and steelhead trout.
  6. The following information will be collected in the field on each fish identified in Item 5 above:
     a). Location of capture, including near shore habitat type and water storage.
     b). Date and time of capture.
     c). Fish condition, including abrasions or other obvious injuries or scale loss.

b. Physical Factors:
  1. Surface water temperatures in degrees Fahrenheit.
  2. Weather as it effects monitoring, including wind and/or rain.
  3. Secchi disk depth.
  4. Conditions of wind and tide as it relates to survey efficiency.

c. Other:
  1. Incidental Observations.
  2. Presence and major types of submerged vegetation.
  3. Observations of animals, including presence and activities of beavers, otters, birds, raccoons, coyotes, etc.

Captured chinook salmon and steelhead trout will be handled with extreme care and kept in cool local water to the maximum extent possible during sampling and processing procedures. Artificial slime products or anesthetics will be used as appropriate to reduce physiological or osmotic stress. Salmonids handled out-of-water for the purpose of recording biological information shall be anesthetized when necessary to prevent mortality. Anesthetized fish shall be allowed to recover (e.g. in a recovery bucket) before being released. Fish that are only counted will remain in water but will not be anesthetized.

With gear that captures a mixture of species, such as chinook salmon and steelhead, these species will be removed and processed first and returned to the water as soon as possible.

If any adult chinook salmon are captured incidental to sampling activities in November through May, they will be released without further handling. Such take will be recorded and reported.

Any listed species mortalities will be placed in labeled whirl-pak bags and promptly frozen. Labels will include the date/location of capture and the fork length of the fish. NMFS will be notified of any listed species mortalities within 72 hours. The conditions of the December 8, 1998 formal consultation by the U.S. Fish and Wildlife Service for Corps Permit # 199700247, for collection of Delta smelt will be implemented. These include provisions for reporting of any take of Delta smelt and correct processing of any mortalities.

Monitoring Duration:

Monitoring will be completed annually for a total of five years. It will commence within the first year after project construction and upon completion of this biological opinion. Electrofishing, seining, and gillnetting methods will be use only during the spring months while trapping will be conducted year round. Monitoring can be discontinued upon Corps approval if project goals are met.

Reports:

Annual written monitoring reports will be prepared. Use of graphs or tables as appropriate is encouraged. Reports will summarize all monitoring data collected for the prior calender year, and shall include, but not be limited to, the following:

a. Dates of all monitoring activities.
b. Names and employers of participants.
c. Locations of specific monitoring areas, including channels sampled and index sites.
d. Information pertaining to monitoring effectiveness, including but not limited to physical conditions affecting monitoring like wind, turbidity, water temperatures, etc.
e. Presentation of data including all data required via the Program.
f. Numbers of each fish species caught by station or monitoring area, by method (e.g. electrofishing), by seine haul or electrofishing time expended, etc.
g. Comparison of data with other existing data, or pre-existing data from the same areas and with numbers both inside and outside of the restoration area.
h. Name of contact person for report.
i. Mortality of any Special Status fish species (this will be identified in a separate section of the report).

The annual fisheries monitoring report will reference whenever possible the DWR-prepared monitoring report required under the Decker Island Habitat Restoration Program.

Report Distribution:

Annual monitoring reports shall be distributed to the following agencies/offices:

a. U.S. Fish and Wildlife Service, Sacramento Field Office, Sacramento, California
b. National Marine Fisheries Service, Sacramento Area Office, Sacramento, California
c. Department of Water Resources, Central District Office, Sacramento, California
d. Department of Fish and Game, Sacramento Valley and Central Sierra Region Office, Rancho Cordova, California
e. U.S. Army Corps of Engineers, Sacramento District, Regulatory Branch, Sacramento, California
f. State Lands Commission, Sacramento Office, Sacramento, California

III. LISTED SPECIES AND CRITICAL HABITAT

This biological opinion analyzes the effects of the described Decker Island Fish Monitoring Program on the following federally listed species: (1) endangered Sacramento River winter-run chinook salmon(*Oncorhynchus tshawytscha*); (2) threatened Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*); and, (3) threatened Central Valley steelhead (*Oncorhynchus mykiss*). These species may be incidentally captured during activities associated with the Decker Island Fish Monitoring Program. The planned fish sampling activities for the monitoring program will not affect designated critical habitat for the species listed above, therefore, effects of the Decker Island Fish Monitoring Program on critical habitat will not be considered in this biological opinion.

Sacramento River Winter-run Chinook Salmon - Endangered: Population Trends, Life History, and Biological Requirements.

The Sacramento River winter-run chinook salmon (*Oncorhynchus tshawytscha*) is one of four distinct runs of chinook salmon in the Sacramento River and was listed as endangered by NMFS on January 4, 1994 (59 FR 440). Estimated winter-run chinook salmon run size took a dramatic decline between 1969 and 1991, from an estimated 117, 808 fish to an estimate of 191. The lowest run size was reported in 1994 with an estimate of 189. Since 1994 the adult population has remained at a low level relative to the historical population size although the general trend has been an increase in estimated run size. The estimated run size for Sacramento River winter-run chinook salmon in 2001, based on carcass survey data, ranges from 7,572 to 12,120 adults, depending on the formula applied (CDFG 2002). However, since the winter-run population level remains relatively low compared to historical numbers the population is still considered at risk.

Adult winter-run chinook salmon generally leave the ocean and migrate through the Sacramento-San Joaquin Delta to the upper Sacramento River from December through June. The majority of winter-run chinook salmon spawning occurs upstream of Red Bluff Diversion Dam; however, some spawners utilize gravel below the dam. The spawning phase of winter-run chinook salmon primarily occurs from May through July. The eggs are fertilized and buried in the river gravel (redds) where they incubate for approximately two-months.

Emergence of winter-run fry from the gravel begins in early July and continues through September. Juveniles redistribute themselves and rear in the Sacramento River from July through April. The peak emigration of winter-run juveniles through the Sacramento-San Joaquin Delta generally occurs from January through April, but the range of emigration may extend from September through June (Schaffer 1980, Messersmith 1966, CDFG 1993, U.S. Fish and Wildlife Service(USFWS) 1992, USFWS 1993, USFWS 1994). Low to moderate numbers may occur as early as October or November, or later in May, depending on water year type, precipitation and accretion to the Sacramento River, and river flows. Distinct emigration pulses appear to coincide with high precipitation and increased turbidity. Juvenile chinook salmon of winter-run size have also been collected in Montezuma Slough in November, following early fall storms in October (Pickard et al. 1982).

The decline of winter-run chinook salmon populations within the Sacramento River basin can be traced to the loss of spawning habitat, dams and diversions, and reductions in Sacramento River flow. Historically, spawning populations were found in the upper Sacramento River basin, particularly the McCloud, Pit and Little Sacramento Rivers. Construction of Shasta Dam in the 1940's eliminated access to all of the historical spawning habitat in the Sacramento River Basin and reduced winter-run to a single spawning population confined to the mainstem Sacramento River below Keswick Dam (Reynolds et al. 1993). Quantitative estimates of run size for winter-run chinook salmon are not available prior to the completion of Red Bluff Diversion Dam (RBDD) in 1966. Since completion of RBDD, the winter-run population has experienced a dramatic decline, from a high of 117, 808 adults in 1969 to a low of 189 adults in 1994. The timing of this decline roughly corresponds to the period of inadequate water temperature conditions in the upper Sacramento River, initial operations of RBDD, and increased water exports from the Delta. That this decline was largely due to these inland habitat factors is substantiated by the fact that it occurred during a period of relatively productive ocean conditions and stable ocean harvest levels (NMFS 1997). Since 1994, the winter-run population has shown a mild increase, with an estimate for 2001 of 5,499 adults, based on RBDD counts, the highest level since 1981. Although, efforts are being made to reduce the impacts to winter-run, inadequate water temperature conditions in the upper Sacramento River, RBDD operations and water exports from the Delta remain the primary threats to the Sacramento River winter-run chinook salmon population.

Central Valley Spring-run Chinook Salmon - Threatened: Population Trends, Life History, and Biological Requirements

Effective November 16, 1999, NMFS listed Central Valley spring-run chinook salmon (*Oncorhynchus tshawytscha*) as threatened under the Endangered Species Act (64 FR 50394). Historically, spring-run chinook salmon were predominant throughout the Central Valley, occupying the upper and middle reaches of the San Joaquin, American, Yuba, Feather, Sacramento, McCloud, and Pit Rivers, with smaller populations in most other tributaries with sufficient habitat for over-summering adults (Stone 1874, Rutter 1904, Clark 1929). The Central

Valley drainage as a whole is estimated to have supported spring-run chinook salmon runs as large as 600,000 fish between the late 1880s and 1940s (CDFG 1998). Before the construction of Friant Dam, nearly 50,000 adults were counted in the San Joaquin River (Fry 1961). Following the completion of Friant Dam, the native population from the San Joaquin River and its tributaries was extirpated. Spring-run chinook salmon no longer exist in the American River due to Folsom Dam.

Impassable dams block access to most of the historical headwater spawning and rearing habitat of Central Valley spring-run chinook salmon. In addition, much of the remaining, accessible spawning and rearing habitat is severely degraded by elevated water temperatures, agricultural and municipal water diversions, unscreened and poorly screen water intakes, restricted and regulated stream flows, levee and bank stabilization, and poor quality and quantity of riparian and shaded riverine aquatic (SRA) cover.

Natural spawning populations of Central Valley spring-run chinook salmon are currently restricted to accessible reaches in the upper Sacramento River, Antelope Creek, Battle Creek, Beegum Creek, Big Chico Creek, Butte Creek, Clear Creek, Deer Creek, Feather River, Mill Creek, and Yuba River (CDFG 1998). With the exception of Butte Creek and the Feather River, these populations are relatively small ranging from a few fish to several hundred. Butte Creek returns in 1998 and 1999 numbered approximately 20,000 and 3,600, respectively (CDFG unpublished data).

Spring-run chinook salmon adults are estimated to leave the ocean and enter the Sacramento River from March to July (Myers et al. 1998). When they enter freshwater, spring-run chinook salmon are immature and they must stage for several months before spawning. Their gonads mature during their summer holding period in freshwater. Over-summering adults require cold-water refuges such as deep pools to conserve energy for gamete production, redd construction, spawning, and redd guarding.

Spawning typically occurs between late-August and early October with a peak in September. Once spawning is completed, adult spring-run chinook salmon die. Spawning typically occurs in gravel beds that are located at the tails of holding pools (USFWS 1995). Eggs are deposited within the gravel where incubation, hatching, and subsequent emergence takes place.

Length of time required for eggs to develop and hatch is dependant on water temperature and is quite variable, however, hatching generally occurs within 40 to 60 days of fertilization (Vogel and Marine 1991). In Deer and Mill creeks, embryos hatch following a 3-5 month incubation period (USFWS 1995).

After hatching, pre-emergent fry remain in the gravel living on yolk-sac reserves for another two to four weeks until emergence. Timing of emergence within different drainages is strongly influenced by water temperature. Emergence of spring-run chinook typically occurs from November through January in Butte and Big Chico Creeks and from January through March in Mill and Deer Creeks (CDFG 1998).

Post-emergent fry seek out shallow, near shore areas with slow current and good cover, and begin feeding on small terrestrial and aquatic insects and aquatic crustaceans. As they grow to 50 to 75 mm in length, the juvenile salmon move out into deeper, swifter water, but continue to use available cover.

In Deer and Mill creeks, juvenile spring-run chinook, during most years, spend 9-10 months in the streams, although some may spend as long as 18 months in freshwater. Most of these "yearling" spring-run chinook move downstream in the first high flows of the winter from November through January (USFWS 1995, CDFG 1998). In Butte and Big Chico creeks, spring-run chinook juveniles typically exit their natal tributaries soon after emergence during December and January, while some remain throughout the summer and exit the following fall as yearlings. In the Sacramento River and other tributaries, juveniles may begin migrating downstream almost immediately following emergence from the gravel with emigration occurring from December through March (Moyle, et al. 1989, Vogel and Marine 1991). Fry and parr may spend time rearing within riverine and/or estuarine habitats including natal tributaries, the Sacramento River, non-natal tributaries to the Sacramento River, and the Sacramento-San Joaquin Delta. In general, emigrating juveniles that are younger (smaller) reside longer in estuaries such as the Delta (Kjelson et al. 1982, Levy and Northcote 1982, Healey 1991). The brackish water areas in estuaries moderate the physiological stress that occurs during parr-smolt transitions. Although fry and fingerlings can enter the Delta as early as January and as late as June, their length of residency within the Delta is unknown but probably lessens as the season progresses into the late spring months (CDFG 1998).

In preparation for their entry into a saline environment, juvenile salmon undergo physiological transformations known as smoltification that adapt them for their transition to salt water (Hoar 1976). These transformations include different swimming behavior and proficiency, lower swimming stamina, and increased buoyancy that also make the fish more likely to be passively transported by currents (Saunders 1965, Folmar and Dickhoff 1980, Smith 1982). In general, smoltification is timed to be completed as fish are near the fresh water to salt water transition. Too long a migration delay after the process begins is believed to cause the fish to miss the "biological window" of optimal physiological condition for the transition (Walters et al. 1978).

Chinook salmon spend between one and four years in the ocean before returning to their natal streams to spawn (Myers et al. 1998). Fisher (1994) reported that 87% of returning spring-run adults are three-years-old based on observations of adult chinook trapped and examined at Red Bluff Diversion Dam between 1985 and 1991.

Recent increases in the abundance of spring-run in several streams tributary to the Sacramento River have been encouraging although Central Valley wide population totals remain dramatically low when compared to historical population levels . The average total Central Valley spring-run chinook salmon population between 1991 and 2001 is estimated at 6,554 adults, about 49% of that recorded for the period of 1980 through 1990 (13,334 adults), and only about 1% of estimated historical populations (prior to 1940). Perhaps the single greatest factor contributing to the dramatic decline in Central Valley spring-run chinook salmon populations has been the construction of dams on the Sacramento and San Joaquin Rivers which have blocked access to spawning habitat upstream. Reduced flows downstream of these impassable barriers combined with water management practices affecting downstream water temperatures, diversions and the introgression between wild spring-run and hatchery spring- and fall-run chinook salmon are believed to have also contributed to the overall population decline.

Central Valley Steelhead - Threatened: Population Trends, Life History, and Biological Requirements

On March 19, 1998 NMFS listed Central Valley steelhead (*Oncorhynchus mykiss*) as threatened under the Endangered Species Act (63 FR 13347). Central Valley steelhead once ranged throughout most of the tributaries and headwaters of the Sacramento and San Joaquin basins prior to dam construction, water development, and watershed disturbance of the 19th and 20th centuries (McEwan and Jackson 1996). Historical documentation exists that show steelhead were once widespread throughout the San Joaquin River system (CALFED 1999). In the early 1960s, the California Fish and Wildlife Plan estimated a total run size of about 40,000 adults for the entire Central Valley including San Francisco Bay (CDFG 1965). The annual run size for Central Valley steelhead in 1991-92 was probably less than 10,000 fish based on dam counts, hatchery returns and past spawning surveys (McEwan and Jackson 1996).

Estimates of steelhead historical habitat can be based on estimates of salmon historical habitat. The extent of habitat loss for steelhead is probably greater than losses for salmon, because steelhead go higher into the drainages than do chinook salmon (Yoshiyama et al. 1996). Clark (1929) estimated that originally there were 6,000 miles of salmon habitat in the Central Valley system and that 80% of this habitat had been lost by 1928. Yoshiyama et al. (1996) calculated that roughly 2,000 miles of salmon habitat was actually available before dam construction and mining, and concluded that 82% of what was present is not accessible today. Clark (1929) did not give details about his calculation. Whether Clark's or Yoshiyama's calculation is used, only remnants of the former steelhead range remain accessible today in the Central Valley.

As with Central Valley spring-run chinook, impassable dams block access to most of the historical headwater spawning and rearing habitat of Central Valley steelhead. In addition, much of the remaining, accessible spawning and rearing habitat is severely degraded by elevated water temperatures, agricultural and municipal water diversions, unscreened and poorly screen water intakes, restricted and regulated stream flows, levee and bank stabilization, and poor quality and quantity of riparian and SRA cover.

At present, wild steelhead stocks appear to be mostly confined to upper Sacramento River tributaries such as Antelope, Deer, and Mill creeks and the Yuba River (McEwan and Jackson 1996). Naturally spawning populations are also known to occur in Butte Creek, and the upper Sacramento, Feather, American, Mokelumne, and Stanislaus Rivers (CALFED 1999). However, the presence of naturally spawning populations appears to correlate well with the presence of fisheries monitoring programs, and recent implementation of new monitoring efforts has found steelhead in streams previously thought not to contain a population, such as Auburn Ravine, Dry Creek, and the Stanislaus River. It is possible that other naturally spawning populations exist in

Central Valley streams, but are undetected due to lack of monitoring or research programs (IEP Steelhead Project Work Team 1999).

All Central Valley steelhead are currently considered winter-run steelhead (McEwan and Jackson 1996), although there are indications that summer steelhead were present in the Sacramento River system prior to the commencement of large-scale dam construction in the 1940's (IEP Steelhead Project Work Team 1999). Adult steelhead migrate upstream in the Sacramento River mainstem from July through March, with peaks in September and February (Bailey 1954; Hallock et al. 1961). The timing of upstream migration is generally correlated with higher flow events, such as freshets or sand bar breaches, and associated lower water temperatures. The preferred temperatures for upstream migration are between 46° F and 52° F (Reiser and Bjornn 1979, Bovee 1978, Bell 1986).

Spawning may begin as early as late December and can extend into April with peaks from January through March (Hallock et al. 1961). Unlike chinook salmon, not all steelhead die after spawning. Some may return to the ocean and repeat the spawning cycle for two or three years; however, the percentage of repeat spawners is generally low (Busby et al. 1996). Steelhead spawn in cool, clear streams featuring suitable gravel size, depth, and current velocity. Intermittent streams may be used for spawning (Barnhart 1986; Everest 1973).

Length of time required for eggs to develop and hatch is dependant on water temperature and is quite variable; hatching varies from about 19 days at an average temperature of 60° F to about 80 days at an average of 42° F. The optimum temperature range for steelhead egg incubation is 46° F to 52° F (Reiser and Bjornn 1979, Bovee 1978, Bell 1986, Leidy and Li 1987). Egg mortality may begin at temperatures above 56° F (McEwan and Jackson 1996).

After hatching, pre-emergent fry remain in the gravel living on yolk-sac reserves for another four to six weeks, but factors such as redd depth, gravel size, siltation, and temperature can speed or retard this time (Shapovalov and Taft 1954). Upon emergence, steelhead fry typically inhabit shallow water along perennial stream banks. Older fry establish territories which they defend. Stream side vegetation is essential for foraging, cover, and general habitat diversity. Steelhead juveniles are usually associated with the bottom of the stream. In winter, they become inactive and hide in available cover, including gravel or woody debris.

The majority of steelhead in their first year of life occupy riffles, although some larger fish inhabit pools or deeper runs. Juvenile steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles. Water temperatures influence the growth rate, population density, swimming ability, ability to capture and metabolize food, and ability to withstand disease of these rearing juveniles. Rearing steelhead juveniles prefer water temperatures of 45° F to 60° F (Reiser and Bjornn 1979, Bovee 1978, Bell 1986). Temperatures above 60° F have been determined to induce varying degrees of chronic stress and associated physiological responses in juvenile steelhead (Leidy and Li 1987).

After spending one to three years in freshwater, juvenile steelhead migrate downstream to the ocean. Most Central Valley steelhead migrate to the ocean after spending two years in freshwater

(Hallock et al. 1961, Hallock 1989). Barnhart (1986) reported that steelhead smolts in California range in size from 14 to 21 cm (fork length). In preparation for their entry into a saline environment, juvenile steelhead undergo physiological transformations known as smoltification that adapt them for their transition to salt water. These transformations include different swimming behavior and proficiency, lower swimming stamina, and increased buoyancy that also make the fish more likely to be passively transported by currents (Saunders 1965, Folmar and Dickhoff 1980, Smith 1982). In general, smoltification is timed to be completed as fish are near the fresh water to salt water transition. Too long a migration delay after the process begins is believed to cause the fish to miss the "biological window" of optimal physiological condition for the transition (Walters et al. 1978). The optimal thermal range during smoltification and seaward migration for steelhead is 44° F to 52° F (Leidy and Li 1987, Rich 1997) and temperatures above 55.4° F have been observed to inhibit formation and decrease activity of gill (Na and K) ATPase activity in steelhead, with concomitant reductions in migratory behavior and seawater survival (Zaugg and Wagner 1973, Adams et. al 1975). Hallock et al. (1961) found that juvenile steelhead in the Sacramento Basin migrated downstream during most months of the year, but the peak period of emigration occurred in the spring, with a much smaller peak in the fall.

Steelhead spend between one and four years in the ocean (usually one to two years in the Central Valley) before returning to their natal streams to spawn (Barnhart 1986, Busby et al. 1996).

Although it is difficult to estimate historical abundance of Central Valley steelhead in the absence of any real data recent trends have been evident by counts at the RBDD. These counts have declined from an average of 11,187 adults for the ten-year period beginning in 1967, to 2,202 adults annually in the 1990's (McEwan and Jackson 1996). Changes in operation of the RBDD combined with the lack of a comprehensive monitoring program in the tributaries have further limited the ability of biologists to generate reliable steelhead run size estimates in recent years.

IV. ENVIRONMENTAL BASELINE

The environmental baseline is an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat, and ecosystem within the action area (USFWS and NMFS 1998). The action area for this consultation is the lower Sacramento River, approximately between river miles 3.75 and 6.25 adjacent to the northwest boundary of Decker Island, Horseshoe Bend (a slough around the south and eastern sides of the Island), and shallow water habitat (including shaded riverine aquatic habitat) created on the north end of the island through the Decker Island Habitat Development Project.

A. Status of the Listed and Proposed Species and Critical Habitat in the Action Area

Sacramento River winter-run chinook salmon. Historically, the Sacramento-San Joaquin Delta has been used by Sacramento River winter-run chinook salmon as a migration route to and from spawning areas. Adult, fry and juvenile winter-run chinook salmon may still be found seasonally within the action area.

Adult winter-run enter the San Francisco Bay from November through June (Van Woert 1958). They migrate through the Sacramento-San Joaquin Delta and up the Sacramento River from December through early August. Run timing through the Delta typically occurs from December through April.

The peak emigration of winter-run chinook juvenile through the Delta generally occurs from January through April, but the range of emigration may extend from September up to June (Schaffer 1980, Messersmith 1966, CDFG 1993, USFWS 1992, USFWS 1993, USFWS 1994).

Although recent population trends indicate an increase in Sacramento River winter-run chinook salmon abundance, the population remains at an overall low level, with fluctuating return rates, when compared to historical numbers. In addition, the species currently consists of only 1 population in the mainstem Sacramento River. These demographics for Sacramento River winter-run chinook indicate the long-term viability of the ESU remains at risk.

Central Valley spring-run chinook salmon. The Sacramento-San Joaquin Delta is used by Central Valley spring-run chinook salmon as a migration route to and from cooler upstream tributary streams.

Emigrating juvenile sub-yearling and yearling Central Valley spring-run chinook are expected to pass through the action area, including Horseshoe Bend, during the months of November through May. Some juveniles may also rear within the tidal and non-tidal freshwater marshes and other shallow water areas within the action area for short periods during these months. Adult spring-run chinook salmon are also expected to pass through the action area from March through October on their upstream migration to their natal streams for spawning.

Central Valley spring-run chinook populations generally show a continuing population decline, an overall low population abundance, and fluctuating return rates. These demographics for Central Valley spring-run chinook indicate the long-term viability of the ESU is at risk.

Central Valley steelhead. Central Valley steelhead populations within the action area generally show a continuing population decline, an overall low population abundance, and fluctuating return rates. Historical abundance estimates are available for some stocks within the action area but no overall reliable estimates are available.

Emigrating juvenile Central Valley steelhead smolts may pass through the Sacramento River within the action area from January through May. Some juvenile steelhead may utilize tidal and non-tidal freshwater marshes and other shallow water areas within the action area as rearing areas throughout the year. Adult steelhead may pass through the action area from September through March as they migrate upstream to spawn.

B. Factors Affecting Species Environment within the Action Area

The essential features of freshwater and estuarine salmonid habitat include adequate (1) substrate; (2) water quality; (3) water quantity; (4) water temperature; (5) water velocity; (6)

cover/shelter; (7) food; (8) riparian vegetation; (9) space; and (10) safe passage conditions. These features have been affected by human activities such as water management, flood control, agriculture, and urban development throughout the action area. Impacts to these features have led to salmonid population declines significant enough to warrant the listing of several salmonid species in the Central Valley of California.

High water quality and quantity are essential for survival, growth, reproduction, and migration of individuals dependent on riparian and aquatic habitats. Important water quality elements include flows adequate to support the migratory, rearing, and emergence needs of fish and other aquatic organisms. Desired flow conditions for salmonids include an annual abundance of cool, well-oxygenated water with low levels of suspended and deposited sediments or other pollutants that could limit primary production and/or invertebrate abundance and diversity.

Habitat Impacts in the Sacramento-San Joaquin Delta. The Sacramento River Basin provides approximately 75 percent of the water flowing into the Delta while the San Joaquin River Basin and eastside tributaries provide the remainder (DWR 1993). With the completion of upstream reservoir storage projects throughout the Central Valley, the seasonal distribution of flows into the Delta differs substantially from historical patterns. The magnitude and duration of peak flows during the winter and spring are reduced by water impoundment in upstream reservoirs. Instream flows during the summer and early fall months have increased over historic levels for deliveries of municipal and agricultural water supplies. Overall, water management now reduces natural variability by creating more uniform flows year-round.

Juvenile salmonids migrate downstream from their upper river spawning and nursery grounds to lower river reaches and the Delta prior to entering the ocean as smolts. To a great extent, streamflow volume and runoff patterns regulate the quality and quantity of habitat available to juvenile salmonids. Salmon and steelhead are highly adapted to seasonal changes in flow. Increased stream flows in the fall and winter stimulate juvenile salmonid downstream migration, improve rearing habitat, and improve smolt survival to the ocean. Changes in runoff patterns from upstream reservoir storage to the Delta have adversely affected Central Valley salmonids, including winter-run chinook salmon, spring-run chinook salmon and steelhead, through reduced survival of juvenile fish.

Historically, the tidal marshes of the Delta provided a highly productive estuarine environment for juvenile salmonids. During the course of their downstream migration, juvenile salmon and steelhead utilize the Delta's estuarine habitat for seasonal rearing, and as a migration corridor to the sea. Since the 1850's, reclamation of Delta islands for agricultural purposes caused the cumulative loss of 94 percent of the Delta's tidal marshes (Monroe and Lisowski 1992).

In addition to the degradation and loss of estuarine habitat, downstream migrant juvenile salmonids in the Delta have been subject to adverse conditions created by water export operations of the CVP/SWP. Specifically, juvenile salmon have been adversely affected by: (1) water diversion from the mainstem Sacramento River into the Central Delta via the manmade Delta Cross Channel, Georgiana Slough, and Three-mile Slough; (2) upstream or reverse flows of water in the lower San Joaquin River and southern Delta waterways; and (3) entrainment at the CVP/SWP export facilities and associated problems at Clifton Court Forebay. In addition, salmonids are exposed to increased water temperatures from late spring through early fall in the lower Sacramento River and San Joaquin River reaches and the Delta. These temperature increases are primarily caused by the loss of riparian shading, and by thermal inputs from municipal, industrial, and agricultural discharges.

Since 1995, State and Federal agencies and stakeholders associated with the CALFED Bay-Delta program have funded 326 ecosystem projects including projects funded through the Central Valley Improvement Act (CVPIA). These projects include fish passage improvements, the installation of screens to protect fish at diversion points throughout the Bay-Delta system and restoration projects similar to the Decker Island Habitat Restoration Project.

V. EFFECTS OF THE ACTION

General Impacts

The proposed Decker Island Fish Sampling Program has been designed to determine the value of fish habitat previously created by the Decker Island Habitat Restoration Program (construction completed in 2001). Adult and juvenile Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, and Central Valley steelhead are expected to be captured during the Decker Island Fish Monitoring Program. Some common general impacts to the listed species captured during the course of the Decker Island Fish Monitoring Program are: 1) physiological stress; 2) physical damage which may reduce survival for captured juveniles, through increased disease susceptibility or severe injury; and, 3) mortality.

Capture and Handling

The skin, scale and slime complex of salmonids functions as protection from disease, lubrication for swimming efficiency, and maintenance of homeostasis and osmotic integrity. Severe damage to this complex may lead to osmotic dysfunction or death. Descaling of juvenile chinook salmon may occur during capture and handling. Observed physiological responses suggest that descaling of juvenile chinook salmon could result in decreased resistance to disease and other stressors encountered in the field, possibly leading to reduced performance capacity and lowered survival (Gadomski, et. al., 1994).

Electrofishing

Researchers have documented substantial injuries to the spinal columns of fish that had been captured by electrofishing and suggest that electrofishing in the presence of endangered and threatened species should be considered with great caution (Sharber and Carothers 1988, Nielsen 1998).

Physical injuries from electrofishing result from powerful convulsions of body musculature and include spinal compressions, breaks, misalignments, fractured vertebrae and internal hemorrhaging. These injuries are not always externally obvious or fatal. Mahoney (1997 observed 63% of brook trout and brown trout had hemorrhages and spinal injuries after extensive multiple pass electrofishing. Thompson et al (1997) reported that electrofishing caused spinal injuries ranging from 6 to 40% of rainbow trout and 27 to 38% of brown trout. Generally, injury rates are positively correlated with the length of fish. Electrofishing also may significantly lower survival of eggs (Dwyer et al. 1993) and harm developing embryos and larvae of endangered fish (Muth and Ruppert 1997).

Many factors influence the relative effects of electrofishing on fish including conductivity of water, depth of water, substrate, and size of fish. Additionally, the amount of time taken to complete electrofishing within the sample areas, the frequency of sampling through time, crew efficiency, and operator skill have been mentioned as factors influencing the magnitude of electrofishing effects.

NMFS expects that electrofishing within the action area will injure or kill adult and/or juvenile chinook salmon and steelhead. During 22 electrofishing surveys and two gillnet surveys conducted by CDFG staff at various locations within the Sacramento-San Joaquin Delta between May, 1991 and July 1997 a total of 3,320 fish were caught, including 5 juvenile chinook salmon and 29 juvenile steelhead. No adult chinook salmon or steelhead were reported caught during these surveys (CDFG 2001). However, the planned timing of electrofishing surveys, during the spring months, overlaps with the upstream migration of adult Sacramento River winter-run chinook salmon, Central Valley Spring-run chinook salmon and Central Valley steelhead and will occur during peak emigration of juveniles of these species through the Sacramento-San Joaquin Delta. In addition, project planners are projecting some take of listed salmonids annually and throughout the Fish Monitoring Program (see Tables 2 and 3).

Seining, gillnetting, and fish traps

It is anticipated that seining, gillnetting and trapping within the action area will cause injury or death of listed salmonids through physical injury or physiological stress during capture and handling. Factors influencing the relative effects of seining, gillnetting, and traps on fish include the amount of time fish are trapped in the gear, the frequency of sampling through time, crew efficiency, and the skill and efficiency of the crew at handling and removing fish caught in the gear. Gillnetting is expected to be the most likely gear to cause mortality.

CDFG Estimates of Take

A variety of fish species are expected to be collected during Decker Island fish monitoring activities including, but not limited to, the various races of chinook salmon and steelhead. Although the majority of salmonids collected are anticipated to be fall-run chinook salmon, the incidental collection of winter-run and spring-run chinook salmon and steelhead is expected. All fish captured during fish monitoring activities are planned to be released alive, after collection and processing.

The estimated annual upper limit of take of Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, and Central Valley steelhead by the Decker Island Fish Monitoring Program is summarized in Tables 2.

Table 2. The projected annual upper limit of take expected for Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, and Central Valley steelhead during the Decker Island Fish Monitoring Program, by collection method.

Method	Type of take	Sacramento River winter-run chinook salmon		Central Valley spring-run chinook salmon		Central Valley steelhead	
		juveniles	adults	juveniles	adults	juveniles	adults
electrofishing	Capture and/or handling	15	2	15	2	12	2
	unintentional lethal take	3	1	3	1	3	1
seining	Capture and/or handling	40	2	40	2	16	2
	unintentional lethal take	10	1	10	1	4	1
gillnetting	Capture and/or handling	15	2	15	2	6	2
	unintentional lethal take	7	1	7	1	3	1
trapping	Capture and/or handling	15	2	15	2	6	2
	unintentional lethal take	3	1	3	1	2	1
Total - all methods	Capture and/or handling	85	8	85	8	40	8
	unintentional lethal take	23	4	23	4	12	4

These estimates of expected take have been derived using data collected during previous investigations within the Sacramento-San Joaquin River Delta (Frank Gray, CDFG, personal communication). The cumulative upper limit of take anticipated for the 5-year period of the monitoring program is summarized in Table 3.

Table 3. The projected 5-year cumulative take expected for Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, and Central Valley steelhead during the Decker Island Fish Monitoring Program, by collection method.

Method	Type of take	Sacramento River winter-run chinook salmon		Central Valley spring-run chinook salmon		Central Valley steelhead	
		juveniles	adults	juveniles	adults	juveniles	adults
electrofishing	Capture and/or handling	75	10	75	10	60	10
	unintentional lethal take	15	5	15	5	15	5
seining	Capture and/or handling	200	10	200	10	80	10
	unintentional lethal take	50	5	50	5	20	5
gillnetting	Capture and/or handling	75	10	75	10	30	10
	unintentional lethal take	35	5	35	5	15	5
trapping	Capture and/or handling	75	10	75	10	30	10
	unintentional lethal take	15	5	15	5	10	5
Total - all methods	Capture and/or handling	425	40	425	40	200	40
	unintentional lethal take	115	20	115	20	60	20

Adult and juvenile Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon and Central Valley steelhead are expected to be within the action area during fish monitoring. Based on a comparison of recent population levels of Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon and Central Valley steelhead and anticipated annual capture and unintentional lethal take (see Table 2) it is anticipated that the Decker Island Fish Monitoring Program will affect less than 0.1% of adult or juvenile populations. This level of incidental take is not expected to appreciably reduce the likelihood of survival and recovery of Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon and Central Valley steelhead within the Central Valley. Results of the Decker

Island Fish Monitoring Program are expected to have an overall beneficial effect on the survival and recovery of Sacramento River winter-run, Central Valley spring-run chinook salmon and Central Valley steelhead populations due to a better understanding of the response by these populations to habitat restoration activities within the Sacramento-San Joaquin Delta.

VI. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

There are no future State, tribal, local, or private actions planned for the action area that are reasonably certain to occur.

VII. CONCLUSION

Based on the best available scientific and commercial information, the status of the species' environmental baseline, effects of the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed Decker Island Fish Monitoring Program is not likely to jeopardize the continued existence of endangered Sacramento River winter-run chinook salmon, threatened Central Valley spring-run chinook salmon, or threatened Central Valley steelhead.

Notwithstanding NMFS' conclusion that the Decker Island Fish Monitoring Program is not likely to jeopardize the continued existence of endangered Sacramento River winter-run chinook salmon, threatened Central Valley spring-run chinook salmon, and threatened Central Valley steelhead, NMFS anticipates that some actions associated with the Decker Island Fish Monitoring Program may result in incidental take of these species. Therefore, an incidental take statement is included with this Biological Opinion for these actions.

VIII. INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation which actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering. Incidental take is defined as take of a listed animal species that results from, but is not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary and must be undertaken by the Army Corps of Engineers (Corps) so that they become binding conditions of any permit, grant or contract issued to the California Department of Water Resources (DWR) and/or the California Department of Fish and Game (CDFG), as appropriate, for the exemption in section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered in this incidental take statement. If the Corps (1) fails to assume and implement the terms and conditions of the incidental take statement, and/or (2) fails to require the permittee to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit, grant or contract document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Corps and DWR and/or CDFG, must report the progress of the action and its impact on the species to NMFS as specified in this incidental take statement (50 CFR §402.14(i)(3)).

A. Amount or Extent of Take

The proposed sampling methods of the Decker Island Fish Monitoring Program are likely to result in the take of Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon and/or Central Valley steelhead. This incidental take is expected to be in the form of capture, collection, harassment, injury, harm, and death.

The take of Sacramento River winter-run chinook salmon and Central Valley spring-run chinook salmon for Decker Island Fish Monitoring field sampling shall be based on daily size class criteria for species identification used in fisheries monitoring at the SWP fish salvage facilities and the USFWS Delta fisheries monitoring program.

The amount of take of Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon and Central Valley steelhead, annually and cumulatively for the 5-year period of the monitoring program, have been previously described in Tables 2 and 3, respectively. Exceedance of these anticipated take levels, either annually or cumulatively, will equal exceeding authorized take levels for listed salmon or steelhead.

B. Effect of the Take

The effect of this action will consist of fish behavior modification, temporary disorientation, and potential death or injury to juvenile Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon and Central Valley steelhead due to the capture and handling of fish during the sampling activities.

In the accompanying biological opinion, NMFS determined that this level of anticipated take is not likely to result in jeopardy to the listed species.

C. Reasonable and Prudent Measures

NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize the incidental take of listed species caused by the proposed Decker Island Fish Monitoring Program.

1. Measures shall be taken to minimize take associated with electrofishing and gillnetting.

2. Measures shall be taken to minimize exposure and reduce physiological stress and mortality associated with collection, handling, and processing of chinook salmon and steelhead.

3. Measures shall be taken to monitor and report the incidental take of listed species.

D. Terms and Conditions

The Corps is responsible for DWR and CDFG compliance with the following terms and conditions that implement the reasonable and prudent measures described above:

1. Measures shall be taken to minimize take associated with electrofishing and gillnetting.

Terms and conditions:

a) The field supervisor, crew leaders and crew members conducting electrofishing and/or gillnetting surveys must have appropriate training and experience with these techniques.

b) A field supervisor or crew leader having at least 100 hours of electrofishing experience in the field using similar equipment must train the field crew. Training shall include; 1) a review of electrofishing techniques, guidelines (including the requirements of this biological opinion) and recommendations of the equipment manufacturer; 2) a demonstration of the proper use of electrofishing equipment, including an explanation of how gear can injure fish and how to recognize signs of injury

c) A field supervisor or crew leader experienced in conducting electrofishing and/or gillnetting surveys must be present and monitoring these activities at all times.

d) Each electrofishing session must start with all settings (voltage, pulse width, and pulse rate) set to the minimums needed to capture fish. If necessary, these settings can be increased gradually but only to the point where fish are immobilized and captured.

e) Gillnets shall be monitored at all times and pulled and checked for fish at intervals not to exceed every half hour.

2. **Measures shall be taken to minimize exposure and reduce physiological stress and mortality associated with collection, handling, and processing chinook salmon and steelhead**

Terms and conditions:

a) At least one trained and qualified fisheries technician (minimum of 2 years experience with sampling and handling of adult and juvenile anadromous salmonids) shall be onsite during each day of Decker Island Fish Monitoring program field sampling to insure full adherence to sampling and handling protocols described in section II of this opinion.

b) Results of each individual field collection will be monitored by the field crew leader and all fish collected will be transferred immediately to buckets filled with local river water, where the fish will be held during processing.

c) All chinook salmon and steelhead shall be removed, processed first and, immediately after enumeration and measurement, returned to the water at a location downstream of the sampling site as soon as possible. No fish will be transported more than 1/4 mile from the sampling site. Field personnel shall visually monitor and record the condition of these fish (e.g. healthy and vigorous, lethargic, loss of equilibrium, etc) immediately before release.

d) In the event that the number of Sacramento River winter-run, Central Valley spring-run chinook salmon and/or Central Valley steelhead collected begins to increase within a daily sampling period, or the total annual or cumulative take approaches limits described in Tables 2 and 3, sampling will be modified to reduce take and avoid further loss. In addition, efforts will be made to reduce the time required for sample processing and returning chinook salmon and/or steelhead to the water courses of the action area within the shortest period of time practicable. If take reaches or exceeds anticipated annual or cumulative limits described in Tables 2 and 3, the Corps, DWR, and CDFG must cease monitoring activities and reinitiate consultation prior to continuing field sampling activities.

3. **Measures shall be taken to monitor and report the incidental take of listed species.**

Terms and conditions:

a) Any incidental mortalities of chinook salmon and/or steelhead shall be reported within two (2) working days to the NMFS, Sacramento Field Office (Fax no. (916)930-3629). All juvenile chinook salmon and steelhead mortalities must be retained, placed in whirl-pak or zip-lock bags, labeled with the date and time of collection, fork length, capture method, location of capture, and frozen as soon as possible. All adult chinook salmon and/or steelhead mortalities must be retained, labeled with the date and time of collection, fork length, capture method, location of capture, and frozen as soon as possible. Frozen samples must be retained until specific instructions are provided by the NMFS for disposition.

b) A report summarizing the collection of chinook salmon and steelhead shall be submitted 45 days following completion of each annual sampling period. The report shall include:

(1) a detailed description of activities conducted during the sampling period including the total number of collections, method or type of gear used, the dates and location, number of chinook salmon and steelhead captured and released, and number of chinook salmon and steelhead killed;

(2) specific data for chinook salmon and steelhead shall include, but not be limited to, the number of juvenile chinook taken, the fork length of each individual chinook salmon, race identification of individual salmon by size, time of collection, condition of salmon and steelhead when captured, and location and condition of salmon and steelhead when released;

(3) measures taken to minimize disturbances to listed species and the effectiveness of these measures, the condition of listed species taken, the disposition of listed species in the event of mortality, and a brief narrative of the circumstances surrounding injuries or mortalities; and,

(4) a description of any problems which may have arisen during sampling activities and a statement as to whether or not these had any unforeseen effects.

c) An annual report shall be submitted by December 31st of each year for the duration of the Decker Island Fish Monitoring Program. The annual report shall summarize the results of the monitoring program to date, the success of the monitoring program and the Decker Island Habitat Restoration Program relative to their goals, the annual and cumulative take of chinook salmon and steelhead during fish monitoring, and a detailed description of planned sampling methods, locations, expected sampling period and other pertinent activities for the following year. At the completion of the 5-year Decker Island Fish Monitoring Program a final report detailing study methods, results, conclusions and recommendations shall be provided within 6 months of completion of the monitoring program.

d) All required reports shall be submitted to:

Supervisor, Sacramento Area Office
National Marine Fisheries Service
Protected Resources Division
650 Capitol Mall, Suite 8-300
Sacramento, California 95814-4706

IX. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. These "conservation recommendations" include discretionary measures that the Corps can take to minimize or avoid adverse effects of a proposed action on a listed species or critical habitat or regarding the development of information. NMFS provides the following conservation recommendations that would reduce or avoid adverse impacts on listed species:

1. The Corps should support expanded anadromous salmonid monitoring programs throughout the Sacramento-San Joaquin Delta to improve our understanding of the life history of listed species and improve the ability to provide fisheries protection through real-time management.

2. The Corps should support and promote aquatic and riparian habitat restoration within the Sacramento-San Joaquin Delta with special emphasis upon the protection and restoration of shaded riverine aquatic habitat.

X. REINITIATION OF CONSULTATION

This concludes formal consultation on the actions outlined in the biological opinion for the proposed Decker Island Fish Monitoring Program. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary federal involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, formal consultation shall be reinitiated immediately.

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